Characterization of dislocations in deformation-induced planar boundaries of aluminium

Hong, Chuanshi; Huang, Xiaoxu; Winther, Grethe

Publication date:
2012

Characterization of dislocations in deformation-induced planar boundaries of aluminium

C.S. Hong[1], X. Huang[1] and G. Winther[2]

[1] *Danish-Chinese Center for Nanometals,Department of Wind Energy, Technical University of Denmark, DK-4000 Roskilde, Denmark*
[2] *Department of Mechanical Engineering, Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark*

Keywords: TEM, dislocation boundaries, Burgers vectors, aluminium

During plastic deformation of metals the gliding dislocations interact to give work-hardening and also to form dislocation boundaries, which develop into a regular deformation microstructure within each grain. Morphologically, dislocation boundaries fall in two main categories, one being extended planar boundaries with specific crystallographic alignments and the other being a three-dimensional arrangement of shorter boundaries forming a fairly equiaxed cell structure.

A thorough experimental transmission electron microscopy study of the dislocations in the extended planar boundaries (also termed GNBs) is presented. The Burgers vectors, **b**, were determined using two-beam diffraction contrast experiments where a range of diffractions vectors, **g**, which is sufficient to identify the **b**'s using the **g**· **b**=0 invisibility criterion, was employed.

The Burgers vectors and line directions of the dislocations are determined for eight slip-plane-aligned GNBs coming from three grains of near 45° ND rotated Cube orientation in rolled pure aluminium. An example is presented in Fig. 1.

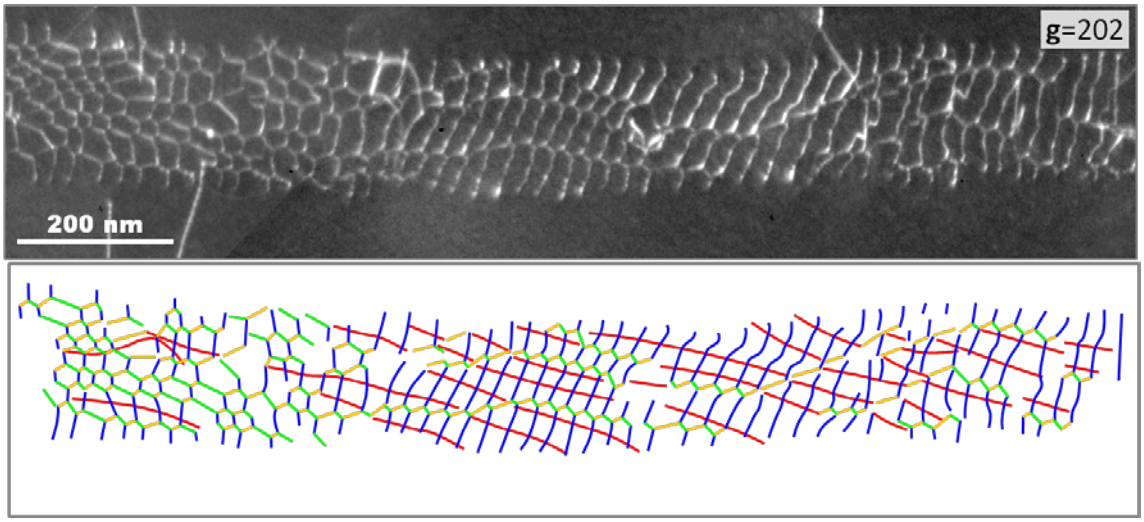

Figure 1 – Identification of dislocations in a GNB observed in a cold rolled Al sample. The colors in the sketch (bottom) designate the identity of the determined b.